

## TRAILER FRAME

**[0001]** This application claims the benefit of U.S. Provisional application no. 60/246,813 filed November 8, 2000. Application serial no. 60/246,813 is hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

**[0002]** This invention relates generally to trailer frames and more particularly to bolt-together trailer frames.

**[0003]** Typically trailer frames are manufactured by welding frame members together. Typical frame members include flat, L-shaped or U-shaped metal rail sections or tube sections. Frequently, spring hangers are welded directly to the rail or tube sections for sprung axle units. An axle tube of a torsion axle can also be directly welded to the rail or tube sections or can be attached using shackles. These trailer frames are used for boat trailers, recreational vehicles, horse trailers, utility trailers, etc.

**[0004]** One problem with welded trailer frames is shipping the completed frame. Because the entire frame including axles is pre-assembled, only a few assembled frames can be shipped at a time. Another problem is inventory. If an recreational vehicle manufacturer uses both torsion axle frames and sprung axle frames or uses multiple size frames, the manufacturer must stock all the various combinations as fully assembled trailer frames, which increases required stock and storage space for stock.

**[0005]** The foregoing illustrates limitations known to exist in present trailer frames. Thus, it is apparent that it would be advantageous to provide an alternative directed to overcoming one or more of the limitations set forth above. Accordingly, a suitable alternative is provided including features more fully disclosed hereinafter.

## SUMMARY OF THE INVENTION

**[0006]** In one aspect of the present invention, this is accomplished by providing an improvement for a bolt-together trailer frame having a plurality of frame members bolted together, wherein the improvement comprises: at least two axle frame members, each axle frame member having at least one axle cut-out in a lower portion thereof; at least one cut-out reinforcing member about the at least one axle cut-out; and at least one axle member, the at least one axle member comprising one of: at least one torsion axle integral with two cut-out reinforcing members; and at least one sprung axle unit, each sprung axle unit comprising: a plurality of spring hangers attached to the at least one axle frame member; leaf springs attached to the spring hangers; and an axle attached to the leaf springs.

**[0007]** In another aspect of the present invention, this is accomplished by providing a method of assembling a bolt-together trailer frame comprising: providing a plurality of frame members including at least two axle frame members, each axle frame member having at least one axle cut-out therein; fastening the plurality of frame members together with a plurality of threaded connectors; fastening an axle cut-out reinforcing member about each axle cut-out; and attaching at least torsion axle or sprung axle to the axle frame members.

**[0008]** In another aspect of the present invention, this is accomplished by adding a sprung axle support box to a bolt together trailer frame. The support box consists of stiffeners plates added to the trailer axle frame members adjacent to the sprung axle along with cross members connected to the axle frame members just in front of and behind the sprung axle spring hangers.

**[0009]** The foregoing and other aspects will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawing figures.

## BRIEF DESCRIPTION OF THE DRAWING FIGURES

**[0010]** FIG. 1 shows a perspective view of a double axle bolt-together trailer frame according to the present invention with double torsion axles;

FIG. 2 shows a perspective view of a second embodiment of a double axle bolt-together trailer frame with double sprung axles;

FIG. 3 is an enlarged view of a section of the first embodiment of a bolt-together trailer frame illustrating details of a single axle trailer frame and single sprung axle;

FIG. 4 is an enlarged view of a section of the first embodiment of a bolt-together trailer frame illustrating details of a double axle trailer frame and double sprung axles;

FIG. 5 is an enlarged view of a section of the first embodiment of a bolt-together trailer frame illustrating details of a single axle trailer frame and single torsion axle;

FIG. 6 is a perspective view of a reinforcement bracket for use with a bolt-together trailer frame;

FIG. 7 is a perspective view of a second reinforcement bracket for use with a bolt together trailer frame;

FIG. 8 is an inside perspective view illustrating the connection of two frame members with the reinforcement brackets shown in figures, only one frame member being shown for clarity;

FIG. 9 is an outside perspective view of the connection of the two frame members shown in FIG. 8;

FIG. 10 is a second inside perspective of the connection of two frame members shown in FIG. 8 with one inside reinforcement bracket being removed for clarity;

FIG. 11 is an enlarged perspective view of the sprung axle support box portion of the trailer frame shown in FIG. 2;

FIG. 12 is a cross-sectional view of an axle frame member, stiffener plate and spring hanger;

FIG. 13 is a partial side view of an axle frame member, illustrating the axle cutout and stiffener plate; and

FIG. 14 is an enlarged partial side view of the trailer frame shown in FIG. 2 showing the sprung axle and spring member.

### DETAILED DESCRIPTION

[0011] The FIGURES show a bolt-together trailer frame 10 that can accept either a torsion axle 40 or a sprung axle 30 without modification of the trailer frame side members. This allows a trailer manufacturer or a recreational vehicle manufacturer to reduce parts inventory. The manufacturer no longer has to stock fully assembled trailer frames with both torsion axles and sprung axles. The appropriate axle unit can be added at the time the frame 10 is assembled.

[0012] The trailer frame 10 shown in FIG. 1 can be used for both torsion axles and sprung axles. Although, the trailer frame 10 shown in FIG. 2 is primarily intended for use with sprung axles, it could be used with torsion axles.

[0013] The bolt-together trailer frame 10 is assembled from a plurality of frame members 11, front cross member 12, rear cross member 13 and A frame or trailer tongue members 14 that are bolt together with a plurality of threaded fasteners. Additional floor supports or outriggers are added as needed for the particular end product. A rear bumper can be used in addition to the rear cross member 13 as shown in FIG. 1 or the rear cross member 13 can also function as a rear bumper as shown in FIG. 2.

[0014] FIG. 1 shows a bolt-together trailer frame 10 with two torsion axles <sup>30</sup>40. FIG. 2 shows the bolt-together trailer frame 10 with two sprung axle units <sup>30</sup>40. Preferably, when sprung axle units 30 are used, the trailer frame 10 includes a plurality of laterally extending cross supports 15. In the preferred embodiment, the laterally extending cross supports 15 extend from one side frame member 11 to the other side frame member 11. Alternatively,

the cross supports 15 could extend only partially towards the opposite side frame member. Preferably, such part length supports 15 are fastened to a floor (not shown) that is attached to the top surface of trailer frame 10.

**[0015]** FIGS. 3, 4 and 5 show enlarged views of the side frame members 11 illustrating the axle attachments to the trailer frame 10. FIGS. 3 and 4 show a single sprung axle and double sprung axle, respectively. FIG. 5 shows a single torsion axle frame. Preferably, the side frame members 11 for both a torsion axle 40 and a sprung axle unit 30 are the same. The side frame member 11 includes at least one axle cut-out 20 (best shown in FIGS. 8 through 10), which allows clearance for the axle. The axle cut-out 20 can be reinforced on the inside with a laterally extending flange or eyebrow 21. A plurality of through apertures or bolt holes 25 are provided about the axle cut-out 20. Some of the apertures 25 are provided with dimples 24 about the apertures. In one embodiment a cut-out reinforcing member or plate 22 is fastened about the axle cut-out 20 to the axle frame member 11 with a plurality of threaded fasteners. The cut-out reinforcing plate 22 includes corresponding dimples 23 that nest in the cut-out dimples 24 to strengthen the connection of plate 22 to axle frame member 11 and to increase twisting or torque resistance.

**[0016]** For attaching a sprung axle unit 30, as shown in FIGS. 3 and 4, spring hangers 34, 38 are attached to the side frame member 11, preferably using threaded fasteners. A reinforcing member 35, 50 is normally provided between the spring hangers 34, 28 and the side frame member 11. For a single sprung axle unit 30, two spring hangers 34 are attached to the side frame member 11 with a flat gusset 35 between the spring hanger 34 and the side frame member 11. The gusset 35 may be welded or bolted to the side frame member 11. The gusset 35 provides additional reinforcement of the side frame member 11. A plurality of leaf springs 32 are attached to the two spring hangers 34. An axle tube 37 is attached to the leaf springs 32 by shackles 36. The spring hangers 34, leaf springs 32 and attached axle tube 37 form a sprung axle unit 30. A wheel, tire and

wheel bearing and brake unit as needed (not shown) are attached to the end of the axle tube 37.

**[0017]** The attachment of double sprung axle units 30 is similar to the attachment of a single sprung axle unit 30. Spring hangers 34 are used at the outboard ends of the two sprung axle units 30. A pivotable equalizer 38 is used in the center to hang the inboard ends of the leaf springs 32. The pivotable equalizer 38 is attached to the side frame member 11 with an equalizer hanger 39. A reinforcement plate can be used between the equalizer hanger 39 and the side frame member 11. A fish plate or connector reinforcing member 50 is shown in FIG. 4. This type of plate is used when the pivotable equalizer 38 is attached where two side frame members 11 are bolted together. If the double sprung axle units 30 are attached to a single side frame member 11, a more simple plate similar to gusset 35 can be used.

**[0018]** As shown in FIG. 5, for attaching a torsion axle 40 to trailer frame 10, an outer torsion axle tube 42 is attached to cut-out reinforcing member 22, preferably by welding. The cut-out reinforcing plate 22 is attached to the side frame member 11 by bolts or threaded fasteners.

**[0019]** When double axles are attached to two connected side frame members 11, as shown in FIG. 4, connector reinforcement plates 50, 60 are used to reinforce and stiffen the connection of the two side frame members 11. FIGS. 8 through 10 show the details of these connector reinforcement plates 50, 60. A generally flat plate 50, known as a fish plate, is used on the outside of the trailer frame 10. The fish plate 50 includes a plurality of dimples 52 positioned about a plurality of bolt holes 51. The ends of side frame member 11 contain a corresponding plurality of dimples 28 (shown in FIG. 10), also positioned about a plurality of bolt holes. Two connector reinforcing plates 60, known as J brackets, are fastened on the inside of the trailer frame. The J brackets include a corresponding plurality of dimples 62 positioned about a plurality of bolt holes 61. Each J bracket 60 includes a major section 63 that fits against the inside surface of side frame member 11, an inwardly extending lateral section 64 and a return section 65 extending from the lateral section 64.

The J bracket 60 includes the lateral section and the return section to stiffen the J bracket. When the fish plate 50, the two side frame members 11 and the two J brackets 60 are assembled together, dimples 52, 28 and 62 nest together to further stiffen and reinforce the connection of the two side frame members 11 together.

**[0020]** FIG. 2 shows an alternate embodiment of a bolt together trailer frame 10 for use with sprung axles. The basic trailer frame 10 consists of a plurality of framing members attached to one another using fasteners. Two sides, which consist of one or more frame members 11, are fastened to a sprung axle support box 60. For some trailer designs, two end members 12, 13 are attached to the frame members 11. At the front end of the trailer frame 10, two tongue members 14 are attached to the axle frame members 11 and the front end member 12, if present, thereby forming the trailer tongue. The sprung axle support box 60 is typically located in a center portion of the trailer frame 10. Depending upon the intended weight distribution of the trailer, the sprung axle support box 60 is typically positioned to the rear of the center of the trailer frame.

**[0021]** FIG. 11 shows a sprung axle support box 60 for a single axle trailer frame. FIG. 2 shows the sprung axle support box 60 for a double axle trailer frame. The sprung axle support box 60 is essentially the same for both single axle trailer frames and double axle trailer frames. The primary differences are the length of the stiffener plates 61 and the number of spring hangers 34.

**[0022]** The first component of the sprung axle support box is the side box 67 (shown in FIG. 12), which is formed by welding a stiffener plate 61 to the portion of the axle frame member 11 adjacent the axle 37. In this embodiment, the axle frame member 11 is formed with a "C" shape having a vertically extending side flange or portion 11a with top 11b and bottom 11c portions extending away from the side portion 11a. The side 11a, top 11b and bottom 11c portions forming the "C" shape. The bottom portion 11c is not provided in the part of the axle frame member 11 which forms the sprung axle support box 60, as shown in FIGS. 11 and 12. The stiffener plate 61 also has a "C" shape, being formed with a vertically extending side portion 61a and top 61b and bottom 61c portions extending away

the side portion 61a and towards the side member side portion 11a. Stiffener plate 61 is preferably welded to the axle frame member 11, whereby axle frame member top and side portions 11b, 11a, and stiffener plate top, bottom and side portions 61b, 61c, 61a form the enclosed side box 67.

**[0023]** The second component of the sprung axle support box 60 are the two cross members 15. The sprung axle support box cross members 15 are positioned adjacent to the spring hangers 48, with the front cross member 15 being positioned in front of the front most spring hanger 34 and the rear cross member 15 being positioned to the rear of the rear most spring hanger 34. Preferably, cross members 34 have a "C" shape like axle frame members 11. As needed, cross members 15 can have a plurality of weight reducing cutouts 65. Preferably, stiffener plates 61 have no weight reducing cutouts. Preferably cross members 15 extend from one axle frame member 11 to the opposite axle frame members, as shown in FIG. 2. However, cross members 15 could extend only partway towards the opposite axle frame member 11, as described above.

**[0024]** A plurality of spring hangers 34 are attached to the sprung axle support box 60. For a single axle trailer frame, two spring hangers 34 are attached to each axle frame member 11, as shown in FIG. 11. For a double axle trailer frame, three spring hangers 34 are attached to each axle frame member 11, as shown in FIG. 2. Leaf spring 32 are attached to the spring hangers 34 as shown in FIG. 14. An axle 37 is attached to the middle of the leaf springs 32. The spring hangers 34 are preferably welded to the bottom portion 61c of the stiffener plate 61. Also, preferably, the leaf springs 32 are attached to the spring hangers 34 by fasteners, which extend through both side of the spring hangers 34 and adjacent the axle frame member 11. If needed, the spring hanger 34 could also be welded to the axle frame member 11.

**[0025]** As shown in FIG. 13, an axle cutout 20 is provided in each axle frame member 11 for each axle 37. Preferably, the bottom portion 61c of the stiffener plate 61 does not extend below the uppermost point 20a of the axle cutout 20. In both

embodiments, an axle cut-out reinforcement 22, 61 is attached to the axle frame member 11, proximate the axle cut-out 20.